

FIG. 5

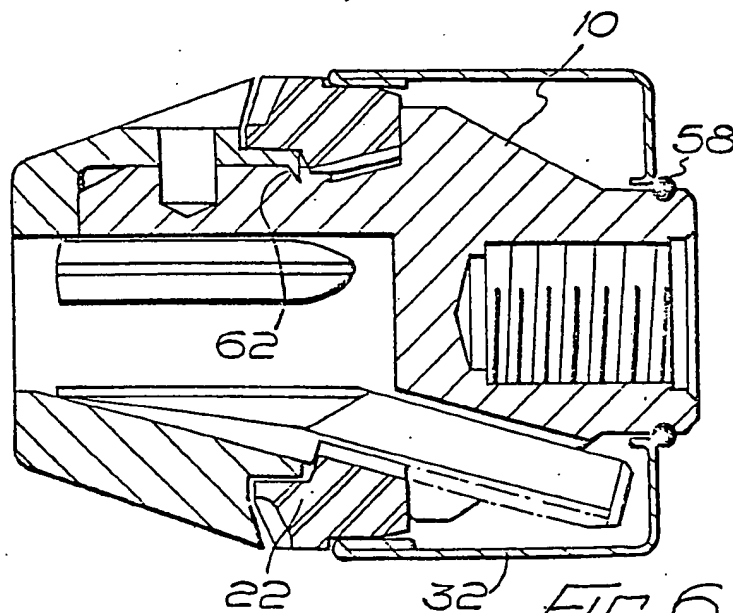


FIG. 6



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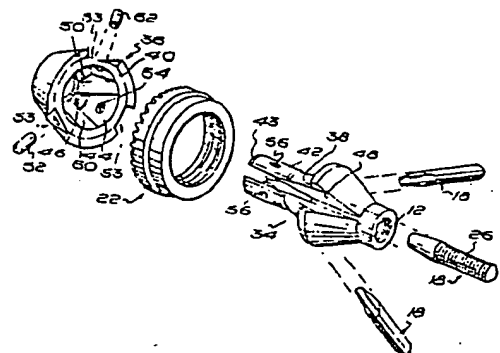
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(54) Drill Chucks.

(57) A drill chuck with a body part (10) in which converging apertures (16) are formed for the reception of respective jaws (18).

To reduce the cost of manufacture of the body part (10), it is formed in two separate parts, that is to say a main body element (34) and a nose cone element, the converging apertures (16) being formed by converging grooves (48) in the main body element (34) and by respective key pieces (50) formed within the nose cone element (36). So that the jaws (18) are better able to resist rotational movement in their apertures (16), the grooves (48) in the main body element will preferably be of V-form, the cross sectional shape of each jaw (18) being of complementary shape.



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"Drill chucks"

The invention relates to drill chucks and has for its object to provide an improvement therein.

The well known kind of drill chuck to which the invention relates has a body part in which
5 converging apertures are formed for the reception of respective jaws, said body part being formed also, intermediate its ends, with a circumferential groove for the reception of a nut with a tapering internal
10 thread so that the latter can engage thread elements formed on the respective jaws. This kind of chuck, which will throughout this specification be termed of the kind referred to, has a bevel gear element which can be operated by an extraneous key to
15 rotate the nut so that the jaws can be advanced through a forward portion of the body part to grip a drill shank or so that the jaws can be retracted to release the drill shank. Because it has been impossible to otherwise assemble the nut in its
20 groove, the nut has heretofore been formed in two parts, that is to say has been diametrically split, and has sometimes been held together in its groove by the bevel gear element which, being formed as an

unbroken ring, has been fitted tightly around the assembled nut. In other cases, when the bevel gear element has been formed integrally with the nut and has therefore itself been formed in two parts, the halves of the integral nut and bevel gear element have been held together in the groove in the body part by a cylindrical sleeve.

The fact that it has heretofore been necessary to very accurately drill and ream the converging apertures for the reception of the respective jaws has meant that the body part has been a relatively expensive item to manufacture and has dictated the fact that the jaws have been of circular cross section. The only thing preventing complete rotational movement of said jaws in their apertures has been the engagement of their thread elements with very small portions of the tapering internal thread of the nut. Due to the converging nature of the apertures and the resultant tapering of the internal thread, working clearances are present between the thread elements, which allow a partial rotational movement of the jaws in their apertures. This partial rotational movement is known as "toggle" and is detrimental to the maintenance of chuck accuracy. The need to prevent, or reduce to a minimum, such rotational looseness in a newly manufactured chuck has necessitated very high quality control and therefore high cost in

manufacture.

The invention as claimed is intended to provide a remedy. It solves the problem of how to design a drill chuck in which the jaws are better
5 able to resist rotational movement in their apertures.

The advantages offered by the invention are mainly that the bevel gear, or an element comprising the nut and bevel gear formed integrally
10 together is able to be formed as an unbroken ring, that since the jaws are better able to resist rotational movement in their apertures the maintenance of chuck accuracy is better able to be maintained, and also that the need for very high
15 quality control is reduced so that manufacturing costs are minimised.

In order that the invention may be fully understood and readily carried into effect, the same will now be described, by way of example only,
20 with reference to the accompanying drawings, of which:-

Figure 1 is a side view of a drill chuck embodying the invention,

Figure 2 is an end view thereof, in the
25 direction of arrow 2 in Figure 1,

Figure 3 is a longitudinal section on the line 3-3 in Figure 1,

Figure 4 is an exploded view which will

presently be referred to,

Figure 5 is a view similar to Figure 4 and illustrating a possible modification which will be referred to, and

5 Figure 6 is a view similar to Figure 3 and incorporating the modification illustrated in Figure 5.

Referring now to Figures 1 to 3 of the drawings, the drill chuck there illustrated
10 includes a body part generally indicated 10 having at one end a screwthreaded recess 12 for the reception of a power tool driving spindle (not shown) and at its other end an axially extending bore 14 for the reception of a drill shank (not
15 shown). Three equally spaced apertures 16 diverge from the axially extending bore 14 for the reception of respective jaws 18, the jaws being slidably mounted in the apertures so that as they are advanced they converge to grip a drill shank
20 (not shown) between parallel end portions and when they are retracted into the body part they release the shank.

A circumferential groove 20 extends around the body part intermediate the ends of the latter
25 and breaks into the apertures 16. An integral nut and bevel gear element 22 is located in the groove and the nut portion thereof, which is formed with a tapering internal screwthread, has threaded

engagement with thread elements 26 of the jaws 18.
The bevel gear portion 28 of the element 22 is
located rearwardly of a portion of the body part in
which three equally spaced radial blind holes 30
5 are formed, said blind holes being provided for
the reception of a pilot end of an extraneous
chuck key (not shown) having a bevel pinion
capable of engaging the teeth of the bevel gear
portion 28. In this way the chuck jaws can be
10 simultaneously advanced or retracted, as required,
in known manner. A cylindrical sleeve 32 of
pressed steel construction is press fitted at one
end on a stepped down diameter of the bevel gear
portion 28. The other end of the sleeve is
15 provided with an inturned flange portion which
engages rotatably on a rearward portion of the
body part.

Referring now to Figure 4, this
illustrates the two part construction of the body
20 part 10, that is to say the fitment together of a
main body element 34 and a nose cone element 36
with the integral nut and bevel gear element 22,
which is shown to be formed as an unbroken ring,
disposed between them. As shown, one side wall of
25 the circumferential groove 20 in which the nut and
bevel gear element is located in the assembled
body part is constituted by a shoulder 38 formed
on the main body element. The other side wall of

said groove is constituted by an end surface 40 of the nose cone element 36. As the main body element and the nose cone element are assembled together, part cylindrical surfaces 42 of the former engage and slide along complementary part cylindrical surfaces 44 within the nose cone element until end surfaces of the main body element abut against an internal shoulder 46 formed within the nose cone element. Bevel surfaces 43 at the ends of said part cylindrical surfaces mate with complementary tapered surfaces within the nose element as the two parts are assembled together.

It will be seen that the three equally spaced apertures 16 for the reception of the respective jaws 18 are formed by three converging grooves 48 in the main body element and by respective key pieces 50 which are formed, as shown, within the nose cone element. When the two components are assembled together the key pieces 50 are located within the forward portions of said grooves. It will also be seen that the grooves 48 are each of mainly V-form, the cross sectional shape of each jaw 18 being of complementary shape.

Referring again to Figure 3, it will be seen that when the body part has been assembled, respective split spring steel sleeves 52 are inserted through aligned holes in the nose cone

element and the main body element to form liners for the blind holes in which a pilot end of an extraneous chuck key can be received, that is to say inserted through holes 54 in the nose cone element and into
5 blind holes 56 in the main body element. The nose cone element is provided with notches 53 in the region of the holes 54 which, as best seen in Figure 2, reveal sections of the bevel gear element where the bevel pinion of the chuck key can be engaged with the
10 bevel gear element.

The arrangement is such that by virtue of the V-form of each groove 48 and the fairly flat curvature of the surfaces of the key pieces 50 forming the outer surfaces of the apertures 16, the jaws are held
15 very securely against rotation and outward movement in said apertures. The arrangement is also such that the main body element and the nose cone element can conveniently be manufactured by being moulded or cast. That is to say, each of these items as an
20 alternative to being machined from solid materials can be manufactured either as a synthetic plastics moulding or as a diecasting. The other component parts could also of course be made in a conventional manner or alternatively, for example, the jaws 18 and
25 the integral nut and bevel gear elements 22 may be made of sintered metal. The cylindrical sleeve 32 could also be machined or be of pressed steel construction or could be a synthetic plastics

moulding. The chuck construction is such that manufacturing costs are likely to be much lower than those achieved heretofore in drill chuck manufacture. Nevertheless, the chuck is of pleasing appearance and the nose portion of the chuck is particularly slim so that a person using the chuck has a very clear view of a workpiece even when he is using a relatively short drill bit. The light weight and small dimensions of the chuck are of particular significance.

Referring now to Figure 5, in a possible modification of the invention described above, the forward portion of the main body element, that is to say the portion providing the part cylindrical surfaces 42, has been made a slightly greater diameter than hitherto and the aperture for its reception in the nose cone has been made correspondingly larger so that its wall thickness in the region of the holes 54 is very much reduced. The arrangement is such that the increased wall thickness of the forward portion of the main body element where the blind holes 56 are located ensures an adequate location for the pilot end of the extraneous chuck key without the need for lining them with the spring steel sleeves, that is to say if the main body element is made of metal. If the main body element is made of synthetic plastics material it may still require the metal sleeves 52 shown in Figure 4.

A disadvantage of the modification just

described is that the increased diameter of the forward portion of the main body element prevents the fitment of the integral nut and bevel gear element as an unbroken ring. Consequently, it
5 will be seen that this requires to be diametrically split for fitment in its groove in the body part (and it will of course be realised that this being the case it is not necessary to fit the nut and bevel gear element as the components of the body
10 part are being assembled together; it can be fitted in position in a subsequent assembly operation). In Figure 6, the integral nut and bevel gear element is shown to be held together in its groove by the cylindrical sleeve 32, and,
15 because in this case the inadvertent displacement of said sleeve would constitute a serious safety hazard, the chuck is shown to be provided with abutment means acting between the cylindrical sleeve and the portion of the body part on which
20 the flange portion of the sleeve is rotatably engaged, the abutment means in this case being constituted by a resilient split ring 58 snap fitted in a groove 60 in the body part. A further detail which is illustrated in Figure 6 is the
25 provision of inturned lip portions 62 formed within the nose cone element and adapted to snap fit into shallow grooves in the part cylindrical surfaces 42 of the main body element when the two parts are

fitted together. This detail has been incorporated because of the fact that in this construction the spring steel sleeves 52 provided in the first described embodiment have been omitted. However,
5 it will be understood that this same detail could have been included in said first described embodiment.

In a further possible modification, the body part assembly illustrated in Figure 5 could be
10 fitted with nut and bevel gear elements formed separately, the nut element being diametrically split to enable it to be located in its groove and the bevel gear element being formed as an unbroken ring so that it can encircle the nut element and
15 hold it together.

Various other modifications may be made. For example, the abutment means fitted to the chuck illustrated in Figure 6 need not necessarily be constituted by a resilient split ring snap fitted
20 in a groove in the body part. Such abutment means could alternatively be constituted, for example, by a shoulder formed integrally on the portion of the body part with which the cylindrical sleeve is rotatably engaged and over which the inturned
25 flange portion of the sleeve which forms the bearing surface between the sleeve and the body part must be pressed to take up its required position. As a further alternative, the abutment

means could be constituted by a self-locking ring pressed onto the portion of the body part with which the inturned flange portion of the cylindrical sleeve is rotatably engaged, to abut against the end of said sleeve, the self-locking ring having radially inwardly projecting resilient fingers arranged to bite into the surface of the portion of the body part referred to. As a variation of this, such radially inwardly projecting resilient fingers arranged to bite into the surface of the body part could be formed integrally with the cylindrical sleeve. The cylindrical sleeve could be made of a synthetic plastics material instead of being of pressed steel construction.

Although the V-form of the grooves 48 and of the jaws 18 has been said to be particularly advantageous in locating the jaws in position it is not an essential feature of the invention. It will be understood, for example, that the grooves and the cross sectional shape of the jaws could be substantially of T-shape or some variation of this shape.

The chuck body may of course be provided with a male threaded spigot portion instead of with a female screwthreaded recess 12, if required, and it will be understood that, depending upon the material of which the main body element is made, such means of attachment to a power tool driving spindle may be

formed integrally with said main body element or
formed in or on a metal insert to be moulded in a
body element made of a synthetic plastics material.
Similarly, if the nose cone is made largely of a
5 synthetic plastics material the key pieces could be
made of metal and suitably mounted within the
otherwise plastics part of the nose cone.

CLAIMS:

1. A drill chuck having a body part (10) in which
converging apertures (16) are formed for the reception
of respective jaws (18) said body part being formed
also, intermediate its ends, with a circumferential
5 groove (20) for the reception of a nut with a tapering
internal thread so that the latter can engage thread
elements (26) formed on the respective jaws (18) the
chuck having also a bevel gear element which can be
operated by an extraneous key to rotate the nut so that
10 the jaws can be advanced or retracted in the body part,
characterised in that the body part (10) is constituted
by two separate parts, that is to say by a main body
element (34) and a nose cone element (36) connected
together, the converging apertures (16) for the recep-
15 tion of the respective jaws (18) being formed by
converging grooves (48) in the main body element (34)
and by respective key pieces (50) formed within the
nose cone element (36), said key pieces being located
within forward portions of the grooves (48) in the
20 main body element (34).
2. A drill chuck according to claim 1, further
characterised in that the grooves (48) in the main
body element (34) are each of V-form, or substantially
of V-form, the cross sectional shape of each jaw (18)
25 being of complementary shape.
3. A drill chuck according to either one of the
preceding claims, further characterised in that the nut
and bevel gear elements are formed integrally together,

the body part (10) for the reception of a pilot end of an extraneous chuck key are provided with respective steel sleeves (52).

5 9. A drill chuck according to either one of claims 7 and 8, further characterised in that the nose cone element (36) is provided with notches (53) in the region of the holes (30) which reveal sections of the bevel gear element.

10 10. A drill chuck according to any one of the preceding claims, further characterised in that the nose cone element (36) is provided with inturned lip portions (62) adapted to snap fit into shallow grooves in part cylindrical surfaces (42) of the main body element (34) when the two parts are fitted together.